HUMAN DIMENSIONS OF MANAGING A SUBURBAN DEER HERD: SITUATION ANALYSIS FOR DECISION MAKING BY THE SEATUCK NATIONAL WILDLIFE REFUGE, ISLIP, NY

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INTRODUCTION

The growth and geographic expansion of white-tailed deer (Odocoileus virginianus) in metropolitan or suburban areas in the eastern U.S. is a relatively recent phenomenon, but one that is becoming common (Flyger et al. 1983). The coexistence of suburban deer with humans eventually results in potential economic and sociological conflicts due to deer damage to ornamental plants and gardens, an increase in deer-vehicle collisions and, in some localities, threat of diseases transmitted by deer. The existence of urban "greenbelts" (e.g., bird sanctuaries, county parks) accentuate the problem by providing a refuge where deer may spend most of their time, but from which they can move easily to nearby private land to obtain additional food.

This presents a difficult management problem for state agencies that have responsibility for managing resident wildlife. The conventional solution (i.e., recreational hunting) for reducing deer density generally is not acceptable to humans in urban areas (Flyger et al. 1983), even in locations where such a control can be used safely. The result is often an interagency conflict or one that places private concerns against public agencies. The ensuing controversy tends to focus on whether the solution requires human intervention, and what form any intervention should take.

STUDY PURPOSE AND AREA

The purpose of this study was to quantify the attitudes about white-tailed deer held by residents living in the vicinity of Seatuck National Wildlife Refuge (NWR), Islip, Long Island, New York. Specifically, we were interested in the human perception of deer and deer damage to personal property relative to each individual's attitudes and values about wildlife in general, and relative to their experiences (both positive and negative) with deer in the Islip area.

Wildlife managers and extension specialists who must deal with situations such as that in Islip need several types of situational information to develop an educational program to assist homeowners (Table 1). Besides the extent and magnitude of damage they need to know what proportion of the affected public actively seeks out information on damage control and from whom they seek information. Program planners also need to know how many members of their potential audience already are employing control measures, what those measures are, and how much money has been spent on control. Furthermore, they need to know how their potential audience values wildlife (i.e., the audience's beliefs and attitudes about wildlife and its use, as well as attitudes toward problem tolerance) so that communication can be developed that is not insensitive or offensive to the intended audience. These situational data give the educational communication programmer the "edge" in designing effective programs. This report presents such data for the Islip situation.

Prior to designation as a NWR, the area was the private estate of the Charles Webster family, who donated this land and all buildings on the 200-acre site to the U.S. Fish and Wildlife Service. Concurrent with this donation was the establishment of the Seatuck Research Program at the Refuge in 1981,

Table 1. SITUATIONAL DATA NEEDS FOR EDUCATIONAL-COMMUNICATION-PROGRAM PLANNING TO REDUCE DEER DAMAGE.

Damage Data:	how many people affected
	location of damage
	characterization of damage (plant types)
	cost estimates
	description of damage
Propensity to Control:	
	feelings about damage
	damage-report rate
	damage-control-information-seeking behavior
	damage control activity & expenditures
	attitudes towards wildlife-use beliefs (WAVS)
Property Characteristics:	
	plants susceptible to damage
	deer use/occurrence
Property Owner Characteristics:	
	socioeconomic characteristics
	propensity to control (see above)
	attitudes about deer
	wildlife recreation activities
	acceptability of population control (methods and population trends desired)

which has the mission of conducting research on urban wildlife ecology and management problems associated with urban wildlife; this program is administered by the Cornell Laboratory of Ornithology. Refuge vegetation consists of a mixture of mowed lawns and ornamental plantings in the vicinity of four houses still used for residences or offices, woodlands, open fields, and salt marsh. The Refuge is bounded by Champlin Creek and the Great South Bay on the east and south, respectively, and by the Scully Audubon Sanctuary on the west (Fig. 1). It is through the north end of the Refuge that deer move onto private residential property almost daily during fall-winter, although a few individuals have moved east by swimming across Champlin Creek.

Movements and activity patterns of the Refuge herd of about 30 deer have been studied using radio-telemetry since March 1984. The biological knowledge being obtained about these deer provided a reliable background against which we could compare human attitudes among residents who had "interacted" with deer. The Islip area was ideal for this study because we knew that damage to yard plantings was occurring, and because public concern about Lyme disease was widespread. Furthermore, the continuing study of deer activity patterns enabled us to delineate zones of deer-human contact of varying intensity adjacent to the Refuge. An additional feature of this site for the conduct of our research was the insular nature of the deer herd, so that deer-human interactions in the neighborhood, and locally-derived perceptions about deer could be attributed primarily to the existence of the Seatuck herd.

METHODS

Names and mailing addresses of all residential property owners in the

study area were obtained using property-tax records. Each of the 605 people selected represented an Islip household near Seatuck NWR.

A self-administered, mail-back, booklet-format questionnaire was developed (Appendix A), which was similar to that used in studies of farmers' tolerance of deer damage (Brown et al. 1979, Brown and Decker 1979, Decker et al. 1981a), and landowners' tolerance of black bear damage (Decker et al. 1981b, 1985). Measures of characteristics of property owners and their properties that were pertinent to their proximity to the Seatuck deer herd were included in the questionnaire. This included questions about property owners' experiences with and perceptions of deer, including deer damage; amount of damage (in dollars) incurred; types of plants damaged; primary concerns about deer, including pertinent non-damage items; and attitudes about wildlife in general, and deer in particular.

The mail survey was implemented in early spring 1985. A procedure using up to three follow-up mailings to nonrespondents was employed (cover letters are in Appendix B). In addition, a nonrespondent telephone interview was conducted with nonrespondents within the zone of known deer activity, which was determined from the radio-tracking study.

The study area included residences outside the zone of current deer movements so that a future resurvey, following a period of anticipated herd expansion, would include residences that incurred damage for the first time since the original survey. Thus, we were interested in two audiences within the entire study area that could not be identified *a priori*: a "perceptually-derived deer impact audience" (PDDI), and other residents. Respondents were placed into the PDDI audience if they reported seeing deer or deer sign (including damage) on their property during the previous year, or if

they reported ever seeing a deer in the vicinity of their property. In other words, we divided the respondents into two groups based upon their direct experience with deer in Islip or their lack of such experience. Among the PDDI audience, we developed a perceptual proximity measure that classified people based on the psychological proximity of their experience with Islip deer. The three categories in this measure were: (1) saw a deer in vicinity of property at any time in the past, (2) saw a deer or deer sign on property during the past year, and (3) had deer damage on their property during the past year. Using these resident characteristics as a typology, we analyzed the survey results such that the effects of level of experience with deer were considered. Data were analyzed using the SPSSX and SAS computer program packages. Logistic regression analysis was used to model experiential and perceptual influences on residents' attitudes about the presence of deer in their neighborhood.

RESULTS AND DISCUSSION

Survey Response

The survey of 605 households had 13 undeliverable questionnaires and 406 useable responses, for an adjusted response rate of 68.5% of deliverable questionnaires. Of the respondents, 300 were classified as the PDDI audience. These people had some degree of personal experience with deer in Islip (e.g., sightings, evidence of deer on property, deer damage), and they served as the primary focus of our analysis.

The telephone follow-up of 38 nonrespondents in the zone of known deer activity indicated these people were extremely similar to the overall survey audience. They had lived in the area a similar length of time; reported

nearly identical levels of education; indicated similar experiences, concerns, and attitudes about deer; and gave similar preferences for future deer population trends in Islip.

Characteristics of PDDI Respondents and Their Residences

PDDI respondents were typically middle-aged (median of 47 years old) and had some level of college education (75%); 44% were 4-year college graduates. The ratio of males to females was 55:45. Most respondents reported some household involvement in wildlife-related recreational activities or hobbies during the year preceding the survey. Eighty-one percent of the respondents fed birds, 81% observed wildlife, and 38% photographed wildlife. Deer feeding was reported by 20% of the respondents, and 16% hunted in 1984-85.

Seventy percent of the respondents had lived in their neighborhood for $\geq$5 years, but few had lived there >30 years (8%) (mean = 14.7 years; median = 11.0 years). Almost all residents who were surveyed (95%) maintained shrubs and other woody ornamentals on their home grounds. Many also reported having flower gardens (71%), vegetable gardens (40%), and fruit trees (37%).

Experiences With and Perceptions of Deer

Many residents of Islip (57% of the PDDI audience and 61% of all respondents) were not aware of the study of deer movements that was occurring in their neighborhood despite considerable local publicity about this program. Nevertheless, of the many respondents who had seen deer in the vicinity of their residence (75%), one out of three had seen a deer wearing a collar. Nearly one-half of the respondents (44%) perceived an increasing trend in deer numbers over the 3 years prior to the survey; 16% of the respondents

believed there were fewer deer, 16% thought there were about the same number of deer, and 24% did not know the status of the deer population for the period.

Deer Damage and Control: Overall, 147 (49%) people in the PDDI audience either saw deer or evidence of deer feeding on their residential property during the preceding year. Of these, 72% had seen a deer on their property, 57% had seen deer feeding on their property, and 51% had seen evidence of where deer had been feeding on their property.

During the 12 months prior to the survey, about one-fourth (24-28%) of the people with each category of plants reported deer damage to it. Among Islip residents who experienced deer damage, that to shrubs/ornamental woody plants (76%) and flowers (51%) was reported most commonly, followed by vegetable gardens (30%) and fruit trees (25%). Respondents reported damage to 132 fruit trees and 3,512 shrubs/ornamental plantings. Of respondents with damage to a particular category of plants, 40-60% reported that the extent of damage involved $\geq$50% of their plants. Respondents with damage to shrubs/ornamental plants (other than flowers) were those who reported most frequently having to replace them (65%).

Average costs of replacement for the categories of plants ranged from $34 for garden vegetables to $620 for shrubbery (i.e., per individual reporting damaged plants needing replacement). Replacement cost estimates averaged $48 per fruit tree and $59 per shrub or woody ornamental plant. Total replacement costs for Islip residents for each category of plant ranged from $340 for garden vegetables to $23,000 for shrubbery. An estimate of total replacement costs for plants due to deer damage incurred by Islip residents was $28,000. In this estimate we made three assumptions: (1) all those with damage responded,

(2) respondent's estimates of replacement cost were reasonably accurate, and (3) damage not severe enough to require replacement was not reported. Our appraisal of their estimates, based on local cost of trees and shrubs used in landscaping, was that they were well within the "average" replacement costs typical for the Islip area.

Another cost of deer damage was the cost of control. About 8% of the residents (31% of those with plant damage) used some method of deer damage control, with physical barriers (exclosures) and repellents reported most frequently. Expenditures of up to $4,000 were reported for control (one case), but most people reported much lower costs. In total, Islip residents reportedly spent about $12,000 for deer damage control during the year preceding our survey. Thus, the estimated costs of deer damage incurred plus control measures totalled about $40,000. Consequently, the Islip herd of 30 deer "cost" the community about $1,300/deer in 1984-85.

Few respondents who had observed deer feeding or found evidence of such activity on their property reported damage to any officials (16%). Of those who did report their damage, 76% contacted the Seatuck Research Program, and 29% contacted New York State Department of Environmental Conservation (NYSDEC). Only 21% sought information about damage control, and the Seatuck Research Program was reported most frequently as a source of such information (12%). Retailers of materials for damage control were contacted (11%) nearly as often as Seatuck. NYSDEC, U.S. Fish and Wildlife Service, and Cooperative Extension were contacted less frequently (7%, 3%, and 1%, respectively).

Attitudes About Deer Damage: Three-fourths of Islip residents with deer damage described the level of damage as moderate or less; few indicated

that their deer damage was substantial (13%) or severe (10%), the two most extreme descriptive options on the questionnaire. Respondents who experienced deer damage generally felt it was negligible (33%) or tolerable (33%); 33% indicated the amount of damage they sustained was unreasonable. Average dollar estimates between those reporting tolerable versus intolerable damage (means: $172 vs. $1091; medians: $80 vs. $500) indicated that intolerance of deer damage was associated with considerably higher amounts of damage; ranges in dollar estimates of damage overlapped considerably, however.

Attitudes About Deer: Generally, Islip residents considered deer to be an asset to their community (Fig. 2). Only 9% regarded deer as a nuisance, and believed they could get along without any deer in their neighborhood. Fifty-seven percent enjoyed having deer around their neighborhood, and considered them an aesthetic resource. A substantial minority of Islip (PDDI) residents (29%) believed they could enjoy a few deer in their neighborhood, but had reservations about the presence of deer because of disease or damage potential they associated with deer.

Differences among members of the PDDI audience were apparent when the deer proximity groups were examined (Table 2). Among those who had experienced deer damage recently, about 40% indicated they could enjoy a few deer, but worried about damage and disease; 20% considered deer a nuisance, and believed they could do without any deer in their neighborhood.

A general indication of a person's opinions, beliefs, and attitudes about deer is that person's preference for population trends of deer in their neighborhood. We placed a question about the desirability of future trends immediately after sets of inquiries about the respondent's recent deer sightings, perceptions of past trends in deer numbers, deer damage

Table 2. ATTITUDES TOWARD THE PRESENCE OF DEER EXPRESSED BY THE PERCEPTUALLY-DERIVED DEER IMPACT (PDDI) AUDIENCE.

Deer Perceptual Proximity Measure	Attitude About Deer: Esthetic value, enjoy deer	Enjoy few, worry	Nuisance, no deer	Don't care No Opinion	Total %	n
	Percent					
Saw a deer in vicinity	63.7	24.7	4.8	6.8	100.0	146
Saw deer or deer sign on property	72.1	20.4	1.9	5.6	100.0	54
Reported deer damage	37.5	42.1	19.3	1.1	100.0	88

experienced, and general opinion of deer. Using this indicator, about 72% of the Islip residents (PDDI) surveyed had sufficiently positive attitudes about their neighborhood deer to propose maintaining current numbers, or increasing them (Fig. 3). However, examining the PDDI audience based on deer proximity indicated that those who had experienced deer damage recently had quite different preferences than other Islip residents; a majority of these people wanted the deer population reduced (Table 3).

Deer-related Concerns of Islip Residents

Although the primary focus of this study was to assess the extent and magnitude of deer damage to residential plantings, and attitudes of Islip residents affected by this damage, we sought to measure the occurrence and relative importance of other deer-related concerns. Overall, respondents expressed concern over deer-car collisions and Lyme disease more often than they did about damage (Table 4). Furthermore, Lyme disease was rated as the primary deer-related concern of 50% of the PDDI audience, with deer-car collisions reported as a primary concern by another 41%. Responses from the deer proximity groups indicated that damage to plantings and Lyme disease were greater concerns among people who had reported deer damage than those without damage (Table 5). Deer-car collisions were of less concern to this proximity group than it was to the groups with less proximate interactions with deer (Table 5).

Primary concern of respondents who had seen deer in the vicinity of their home, but not on their property, was split nearly equal between deer-car collisions and Lyme disease (Table 5). Among those with deer on their property, but with no damage to report, deer-car collisions was reported as the

Table 3. DEER POPULATION TREND PREFERENCES OF THE PERCEPTUALLY-DERIVED DEER IMPACT (PDDI) AUDIENCE.

Deer Perceptual Proximity Measure	Preferred Deer Population Trend					Total	
	Moderate Increase	Slight Increase	No Change	Slight Decrease	Moderate Decrease	%	n
	Percent						
Saw a deer in vicinity	21.8	13.6	45.5	4.8	14.3	100.0	147
Saw deer or deer sign on property	27.3	5.5	50.8	5.5	10.9	100.0	55
Reported deer damage	7.0	1.2	39.5	8.1	44.2	100.0	86

Table 4. DEER-RELATED CONCERNS OF ISLIP RESIDENTS.

Concerns	All Respondents		PDDI Audience	
	A Concern[a] Percent(N)	Primary Concern Percent	A Concern[a] Percent(N)	Primary Concern Percent
Deer-car collision	52 (209)	47	57 (153)	41
Lyme disease transmission	43 (175)	44	53 (144)	50
Damage to vegetable garden	9 (38)	1	12 (31)	1
Damage to yard plantings	23 (93)	6	30 (81)	4
Personal injury from deer	10 (39)	2	10 (27)	4
		100%(299)		100%(226)

[a] Data under these categories do not sum to 100% because respondents could give multiple concerns.

Table 5. DEER-RELATED CONCERNS OF THE PERCEPTUALLY-DERIVED DEER IMPACT (PDDI) AUDIENCE, BY PERCEPTUAL PROXIMITY.

Deer Perceptual Proximity Measure	Car Collision		Lyme Disease		Yard Plantings		Personal Injury		Vegetable Garden			
	Concern	Primary Concern	Concern	Primary Concern	Concern	Primary Concern	Concern	Primary Concern	Concern	Primary Concern		
	%[a]	%[b]	%[a]	%[b]	%[a]	%[b]	%[a]	%[b]	%[a]	%[b]	%	n
Saw a deer in vicinity	60.4	48.6	49.3	45.0	14.9	5.4	6.0	0.9	6.7	0.0	100%	111
Saw deer or sign on property	57.1	55.8	44.9	39.5	18.4	0.0	12.2	2.3	12.2	2.3	100%	43
Reported deer damage	50.6	20.8	64.4	62.5	59.8	11.1	14.9	4.2	18.4	1.4	100%	72

[a] Percent indicating the item as a concern for them.

[b] Percent indicating the item as the primary deer concern for them; these %'s sum to 100% across the row.

primary concern by a majority. Among those with deer damage on their property, 62% reported Lyme disease as the primary concern. Combining responses for the last two groups indicated that among Islip residents who knew that deer used their property, 54% reported Lyme disease, 37% reported deer-car collisions or other personal injury from deer, and 9% reported damage to yard plantings and/or vegetable gardens as their primary concern. Thus, from the perspective of a "primary" concern to the most affected audience, damage to plantings was a minor consideration compared with personal well-being of respondents and their families.

The relative effects of these primary concerns on respondents' attitudes toward deer and preferences for future deer population levels were assessed. Concerns over deer-car collisions and personal injury seemed to have little influence on attitudes about deer; most of these respondents indicated that deer were aesthetically valuable, and enjoyed having deer around their neighborhood (Table 6). In fact, as the perceptual proximity of deer experiences increased, the frequency of this positive response increased for people with concern for personal injury, indicating that greater contact with deer led to greater appreciation of them despite these concerns. Fifty-one percent of the respondents concerned with Lyme disease indicated they could enjoy a few deer, but worried about the disease potential; 31% were more positive, indicating they enjoyed deer without reservation. Little difference in response frequency distribution was evident among these people as perceptual proximity increased. Respondents who were concerned primarily with plant damage, especially those who had deer on their property (n=10), indicated the least tolerant attitudes about deer. Fifty percent of these people worried about deer damage and disease, and 30% considered deer a nuisance they could do without.

Table 6. ISLIP RESIDENTS' ATTITUDES ABOUT THE PRESENCE OF DEER, BY PRIMARY CONCERN AND PERCEPTUAL PROXIMITY.

All Respondents' Primary Concern	Attitude About Deer: Esthetic value, enjoy deer	Enjoy few, worry	Nuisance, no deer	Don't care No Opinion	Total %	Total n
	Percent					
Car Collision and Personal Hazard	71.4	14.3	1.4	12.9	100.0	140
Lyme Disease	30.5	50.7	14.1	4.7	100.0	128
Garden and Yard Damage	33.3	38.1	14.3	14.3	100.0	21
All PDDI Audience Primary Concern						
Car Collision and Personal Hazard	79.8	10.6	1.1	8.5	100.0	94
Lyme Disease	32.4	50.9	13.9	2.8	100.0	108
Garden and Yard Damage	31.3	50.0	18.7	0.0	100.0	16
Primary Concern of Residents with Deer on Property						
Car Collision and Personal Hazard	83.3	9.5	2.4	4.8	100.0	42
Lyme Disease	28.3	55.0	15.0	1.7	100.0	60
Garden and Yard Damage	20.0	50.0	30.0	0.0	100.0	10

(Note: this represents only 5 and 3 people, respectively, who had reported deer on their property in 1984-85.)

These concerns about the deer resource were associated with different preferences for future deer population trends. For respondents in the PDDI audience who had deer-car collisions or other personal injury as a primary concern, the majority preference was for maintaining the deer population at current levels (Table 7). However, for PDDI respondents who had either Lyme disease or plant damage as their primary concern, the majority opinion was in favor of a decrease in deer numbers. This was especially true of those who reported deer on their property.

In summary, people who had some degree of experience with Islip deer and enjoyed their presence with no reservation, generally wanted deer numbers to remain at their current levels. People who enjoyed deer but worried about the disease or damage potential, or who considered deer a nuisance, generally wanted fewer deer.

Wildlife Attitudes and Values Scale (WAVS)

The senior author and his coworkers in the Outdoor Recreation Research Unit, Department of Natural Resources, Cornell University, have developed a Wildlife Attitudes and Values Scale (WAVS) as a standard measurement instrument for classifying people based on their attitudes and beliefs about wildlife (Purdy et al. 1984). We have used WAVS in studies spanning several years, several audiences, and in questionnaires directed at several aspects of wildlife management. This measurement device has consistently identified three dimensions to people's attitudes and beliefs about wildlife, which we believe is a fairly valid indicator of their values relative to wildlife.

Table 7. ISLIP RESIDENTS' PREFERENCES FOR DEER POPULATION TREND, BY PRIMARY CONCERN AND PERCEPTUAL PROXIMITY.

All Respondents' Primary Concern	Preferred Deer Population Trend					Total	
	Moderate Increase	Slight Increase	No Change	Slight Decrease	Moderate Decrease	%	n
	Percent						
Car Collision and Personal Hazard	25.4	12.3	52.9	5.1	4.3	100.0	138
Lyme Disease	8.8	5.6	39.2	10.4	36.0	100.0	125
Garden and Yard Damage	5.0	0.0	35.0	15.0	45.0	100.0	20
All PDDI Audience Primary Concern							
Car Collision and Personal Hazard	28.1	8.3	54.2	3.1	6.3	100.0	96
Lyme Disease	6.5	6.5	39.3	8.4	39.3	100.0	107
Garden and Yard Damage	6.3	0.0	25.0	12.5	56.2	100.0	16
Primary Concern of Residents with Deer on Property							
Car Collision and Personal Hazard	32.6	2.3	53.4	7.0	4.7	100.0	43
Lyme Disease	3.4	3.4	37.9	5.1	50.0	100.0	58
Garden and Yard Damage	0.0	0.0	20.0	10.0	70.0	100.0	10

Because values cannot be "measured" directly, these indicators serve as surrogates.

Using a set of 18 items that are independently evaluated by a respondent using a 5-point Likert Scale (Appendix A, Question 19), an individual's attitudes toward wildlife beliefs can be measured. Our experience has demonstrated that there are three categories of these beliefs (Decker in press):

(1) wildlife economic/extractive-use beliefs,

(2) wildlife noneconomic/nonextractive-use beliefs, and

(3) wildlife problem-tolerance beliefs.

Each of these categories represents response sets for the scale items. Although the degree of positive or negative attitudes expressed by individuals may vary considerably, factor analytic techniques have shown that these three categories of beliefs are common and consistent dimensions of how people think about wildlife.

We submitted the data from Islip respondents (PDDI segment) to factor analysis and found that four factors rather than three were identified (Table 8). However, two were nearly identical to our previous (i.e., theoretical) categorizations: wildlife problem-tolerance beliefs, and wildlife economic/extractive-use beliefs. The remaining two factors were a division of wildlife noneconomic/nonextractive-use beliefs, which we have designated as A and B.

Our principal use of WAVS was to distinguish respondents who differed in their attitudes toward the categories of wildlife beliefs, but individual scale items provided insights about a person's attitudes about wildlife. For example, from figures in Appendix C one can assess quickly the levels

Table 8. WILDLIFE ATTITUDES AND VALUES SCALE (WAVS) DIMENSIONS FOR RESIDENTS OF ISLIP, NY.

Wildlife Problem-Tolerance Beliefs
nuisance
damage
disease
personal hazard
Wildlife Extractive/Economic-Use Beliefs
trapping
hunt for food
hunt for recreation
economic benefit to local economies
renewable resource for human use
Wildlife Nonextractive/Noneconomic-Use Beliefs
A) environmental quality monitor
ecological role
learning subject
behavior study
B) vicarious experience
nonextractive recreation
art
existence value
express opinion

of consensus and intensity associated with each scale item dealing with problem tolerance for people with different degrees of psychological proximity to deer (i.e., had deer damage, saw deer or deer sign on property, saw a deer in the vicinity of their home).

Examination of items in the problem-tolerance beliefs portion of the WAVS revealed that residents exhibited a moderate-to-high level of consensus at a low level of intensity for problem tolerance (Fig. 4). These trends were similar for the deer proximity subgroups, except for the disease tolerance item. Those who recently had experienced deer damage exhibited intolerance at a moderate level of consensus but at high intensity (Appendix C). This discrepancy indicated that disease may have been a greater concern for these people than damage. Perhaps, their damage experience acts as an irrefutable reinforcement to them of the close proximity of the disease "threat".

The overall survey audience generally exhibited high consensus/high intensity attitude scores relative to the extractive items in the economic/extractive-use belief portion of the WAVS; these scores indicated disapproving attitudes regarding such uses. Respondents generally were supportive of the notion of managing wildlife as a renewable resource, but were split between taking an approving, disapproving, or "middle-of-the-road" stance about the importance of wildlife for benefits to local economies. Responses on the items in the economic/extractive-use beliefs dimension were similar for all subgroups established by proximity of deer experiences.

The overall survey audience generally exhibited high consensus/moderate-to-very-high intensity attitude scores relative to noneconomic/nonextractive-use beliefs. Respondents, regardless of proximity of deer experiences, regarded these uses of wildlife similarly.

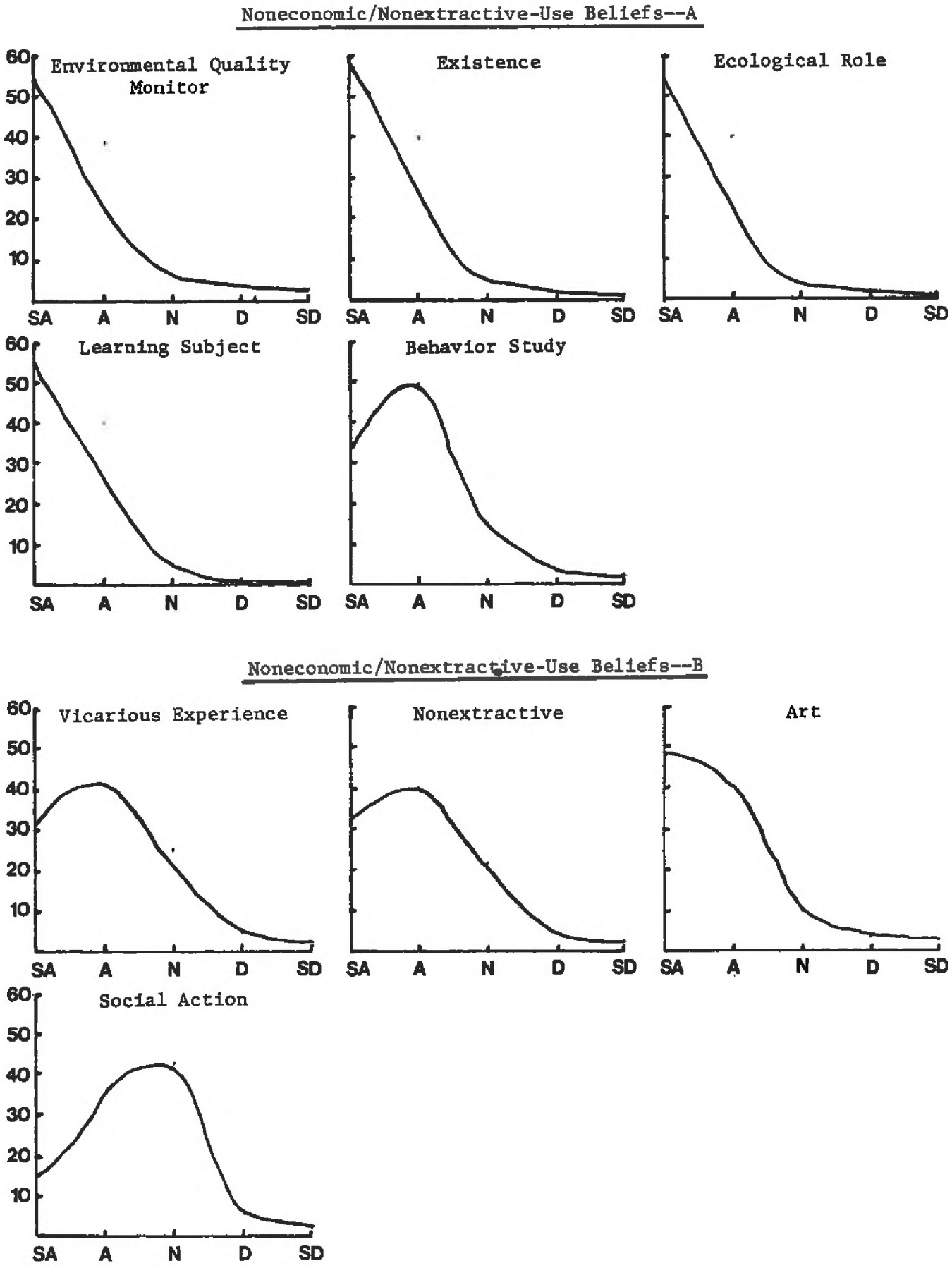

Figure 4. WAVS Item Response Curves (SA=Strongly Agree, A=Agree, N=Neither Agree nor Disagree, D=Disagree, SD=Strongly Disagree).

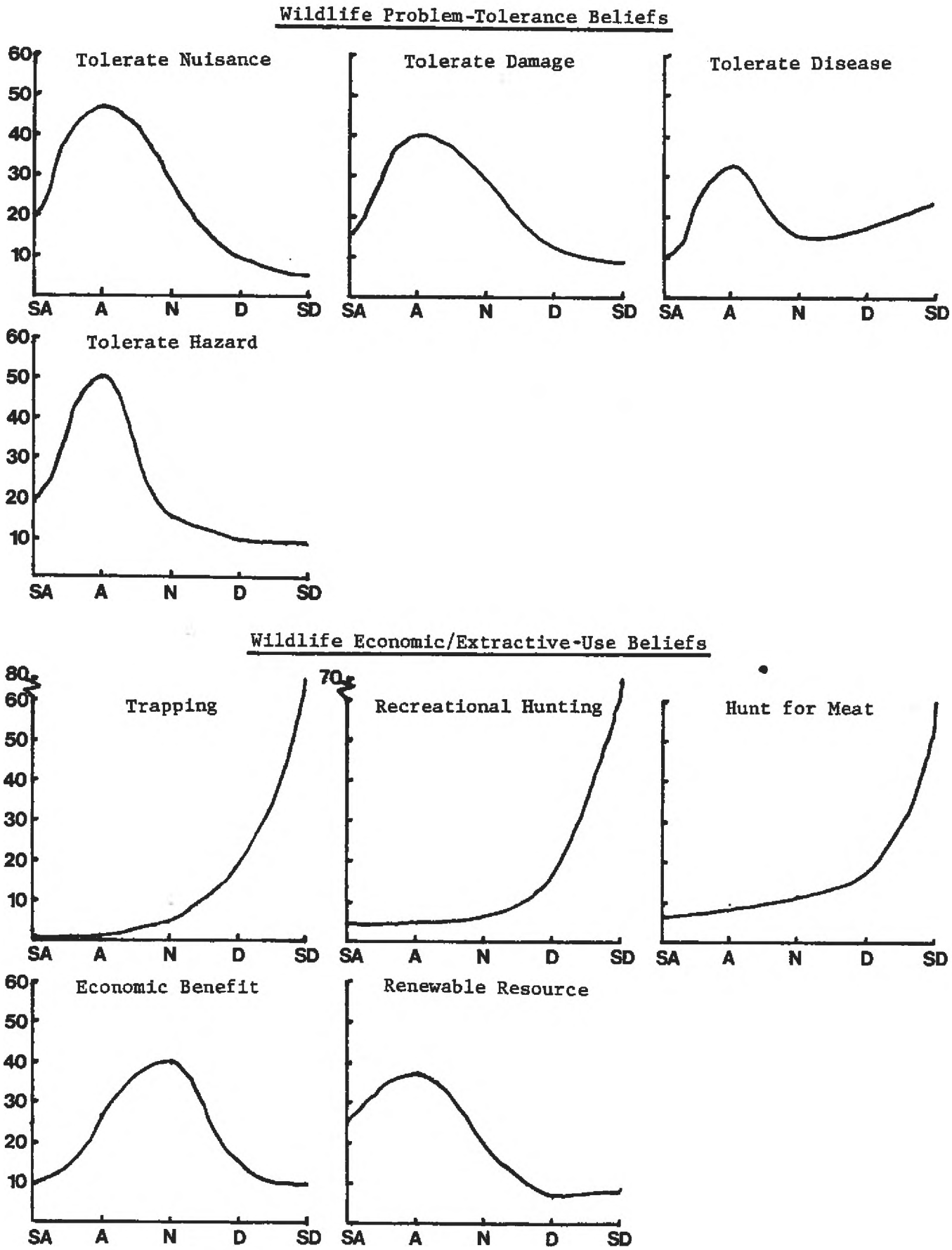

Figure 4(continued).

The relatively high level of both consensus and intensity of attitudes regarding wildlife use is generally an asset to extension and educational communications programming because it indicates homogeneity of an audience, and diminishes the need for audience segmentations vis-a-vis message content. It is apparent that wildlife is valued by this audience of Islip residents, but primarily for nonextractive values and uses. Fortunately, the concept of wildlife as a renewable resource is not contrary to most people's notion of an acceptable basis for wildlife management. This situation makes possible the consideration of herd control to handle the deer problems, but negative responses relating to extractive uses such as recreational and meat hunting warn against the advisability of a sport hunt to control the deer herd. In the Islip situation, other means of control need to be explored, from the standpoint of public acceptability. If a hunt is required, it will have to be preceded by an effective communications program to avert a public relations backlash.

Examining differences in WAVS dimensions scores among people can contribute substantially to understanding fundamental attitudinal-belief orientations. These serve as antecedents to opinion formation and, possibly, to the behavior of people with such opinions. To make comparisons of WAVS dimensions scores between groups of people we have to first undertake a three-step transformation of data. First, scores for each item are standardized to Z-scores. Second, the Z-score of each item is weighted by the item's "factor loading" coefficient for its particular factor (i.e., dimension of the WAVS) derived from the factor analysis. These weighted Z-scores are then averaged for each dimension to yield a dimension score for every individual respondent. The range of index values must lie between -1 to +1, but because no weights from step

2 are likely to be 1.0, the range of index values are likely to be considerably narrower. The resulting index values can be used to compare groups of respondents relative to a WAVS dimension (Table 9). Because the index values originated from a 5-point-response Likert Scale where 1 and 2 are "strongly agree" and "agree", and 4 and 5 are "disagree" and "strongly disagree", an index value preceded by a negative sign denotes a positive or agree position, whereas an index value without the negative sign denotes a negative or disagree position. Index values close to 0.00 (e.g., between -0.10 and +0.10) should be interpreted as "middle-of-the-road", regardless of the sign of the value. With this brief methodological introduction, we can use the WAVS index values to examine three variables: primary deer concern, attitudes about deer presence, and deer population trend preference.

People who reported physical hazard (deer-car collision or personal injury) as a primary concern typically held more positive attitudes about problem-tolerance beliefs and nonextractive/noneconomic-use beliefs (Type A) than those who had Lyme disease or damage to plantings as a primary concern; the latter groups had nearly identical index values. People who were concerned about Lyme disease and had deer use on their property scored particularly low in problem tolerance.

People who believed deer were of "aesthetic value" differed from those who "enjoyed few deer but worried about damage", and from those who considered deer a "nuisance" for problem-tolerance beliefs and nonextractive/noneconomic-use beliefs (Type A). Respondents who considered deer to be a nuisance had extremely negative problem-tolerance beliefs and nonextractive/noneconomic-use beliefs (Type A). The attitudes associated most strongly with deer population trend preferences were those relating to problem-tolerance beliefs

Table 9. STANDARDIZED WAVS DIMENSION SCORES FOR RESPONDENTS WITH VARIOUS CONCERNS, ATTITUDES, AND OPINIONS.

	PDDI Audience			
	Problem Tolerance	Economic/ Extractive	A Noneconomic/ Nonextractive	B Noneconomic/ Nonextractive
Primary Concern				
Personal Hazard	-.16	-.03	-.11	.02
Lyme Disease	.24	.04	.15	.07
Veg./Shrub Damage	.26	-.01	<.01	-.03
Attitude About Deer				
Esthetic	-.28	-.01	-.20	-.09
Enjoy/Worry	.33	-.02	.09	.07
Nuisance	.67	-.01	.77	.14
Don't Care	.28	-.06	.43	.29
Deer Population Trend Preference				
Mod. Increase	-.50	-.02	-.32	-.19
Slight Increase	-.09	.13	-.31	-.01
No Change	-.07	-.04	-.03	.03
Slight Decrease	.16	-.14	.01	-.09
Mod. Decrease	.54	.02	.42	.10

Table 9 (continued)

	Problem Tolerance	Economic/ Extractive	A Noneconomic/ Nonextractive	B Noneconomic/ Nonextractive
	Respondents Who Reported Deer on Property			
Primary Concern				
Personal Hazard	-.19	.02	-.17	.04
Lyme Disease	.34	.01	.16	.04
Veg./Shrub Damage	.11	-.09	-.08	-.09
	Respondents Who Reported Deer Damage			
Primary Concern				
Personal Hazard	-.08	.02	-.07	-.06
Lyme Disease	.31	-.02	.20	.01
Veg./Shrub Damage	.16	-.09	-.04	-.09

and nonextractive/noneconomic-use beliefs (Type A). Thus, problem-tolerance beliefs and nonextractive/noneconomic-use beliefs (Type A) were the dimensions that best distinguished among respondents' attitudes about deer and deer population trend preferences. On the other hand, extractive/economic-use beliefs and nonextractive/noneconomic-use beliefs (Type B) were least distinguishing. Apparently, people who generally regarded the environmental, ecological, existence, etc. values of wildlife positively also believed that the potential problems associated with wildlife should be tolerated. This suggests a broad ecological perspective leading to an acceptance of the notion that wildlife and humans are part of the same natural system. People who did not share this set of beliefs, expressed negative opinions about wildlife -- as reflected in their opinions about deer and preferences for future deer population trends in the Islip situation.

These findings are of considerable significance to the program planner who intends to influence public opinions about deer. They indicate the basis and nature of these opinions, and suggest the difficulty of attempting to effect a change in opinions. That is, the WAVS data clearly indicated that people's opinions about deer were consistent with their basic beliefs about wildlife, rather than spurious responses to two particular questions. The educational-communications-program planner can interpret this as evidence that the opinions reflect a complex belief-attitude system that is unlikely to be changed easily; effective programming over a period of time (i.e., reinforcement) will be required, not a one-shot media blitz or other "quick and dirty" approaches.

What Value, These Islip Deer?

To estimate the value of the local deer herd to Islip residents, with regard to deer damage to landscape plantings only, we can transform the attitudinal data into dollars. This is of greatest usefulness for decision-making; the relative effects of one decision over another can be assessed by impacts on value (i.e., dollars) added or diminished.

The first step in this procedure is selecting a reasonable value of the deer resource to an individual household in the area of deer influence. For our purposes, we regarded each respondent as representing a household, because the sample was selected based on property-tax records. Because the area of deer influence essentially was identical to the holdings of respondents in the PDDI audience (n = 300), we restricted our attention to this audience. The value of deer to be assigned for each household that reported "deer have an aesthetic value" and "they enjoy having them around" was determined from our only dollar estimates of deer: plant damage sustained from deer that was considered "tolerable in exchange for having deer around". Because the ranges of dollars of damage overlapped for those who considered their damage tolerable and those who considered their damage intolerable, we categorized levels of damage, and then looked for that level of damage at which a "cross-over" from majority tolerable to majority intolerable occurred. This was the $500 to $999 category. To be conservative, we chose $500, rather than the category mid-point of $750, to represent the value of deer. A value of $500 also happened to be the median value for damages reported by intolerants, and was also within the range of values reported by tolerant landowners (Fig. 5). Thus, we used $500 as a base for the remainder of this calculation.

To determine the total value of the Islip deer herd to the PDDI audience, we multiplied $500 times the n for the PDDI audience, minus some exclusions. First, to be conservative and to account for the concern for Lyme disease, we included only the 165 respondents who unconditionally stated that deer had aesthetic value. Because we did not receive responses from every person in the study area, some of whom probably saw deer, we took another conservative step by considering them disinterested in deer (i.e., by not adding a proportion of them to our determination of n). Thus,

$500 x 165 = $82,500.

The costs of the deer herd can be thought of as the total damage incurred by those who considered their damage intolerable ($22,920) minus the tolerable portion of that damage. For this calculation we took the number of people reporting intolerable damage (21) and multiplied by $500, the average value of deer, for a total of $10,500, then subtracted this from the total amount of damage reported by the intolerant group:

$22,920 - $10,500 = $12,420.

This amount was then subtracted from the gross value to arrive at a net value:

$82,500 - $12,420 = $70,080.

Thus, the Islip deer herd had an annual net value of over $70,000 to those PDDI residents who had some experience with the deer. Remember, this figure excluded all those with concern for deer damage or disease transmission (i.e., these people were essentially assigned a deer value of $0). This total figure can be adjusted further by deducting the cost of damage control ($12,000), for adjusted net benefits of $58,000.

What are some applications of these values and their implications for

management decision making? Let us take an extreme case of where the deer herd is purposely eliminated from Islip. The real cost of this management action is the cost of the operation required to effect the elimination plus $58,000. (Of course, the other survey data indicated that there may be some community relations costs associated with such action, as well.)

On the other hand, if the disease hazard could be overcome, the value of the deer herd could increase by $41,500, or 72%, to $99,500 (i.e., 83 people reported concern for Lyme disease and did not respond unconditionally that deer were aesthetically valuable).

Similarly, if people also could be made to realize (e.g., via an educational communication program) that deer pose little or no threat to personal safety, and that by driving carefully, deer-car collisions could be reduced to nil, the value of the deer herd could increase by $11,000 (i.e., 22 people reported concern for personal injury/deer-car collision and did not respond unconditionally that deer were aesthetically valuable). Thus, our estimate of the value of this deer herd could nearly double ($58,000 to $110,500) if the concerns about disease and car collisions were overcome.

Another use of these estimates would be in establishing the level of resources to allocate to a deer damage control program. For example, 21 people who reported damage indicated that deer were a nuisance, or that they worried about deer damage. These people had a total of $22,920 estimated damage. Given this information, how much is a reasonable amount to spend for a deer damage control program? If you consider that the average value of deer is $500, then

$500 x 21 = $10,500 and

$22,920 - $10,500 = $12,420.

Therefore, an expenditure for deer damage control that results in a reduction of up to $12,420 of damage annually would be warranted, as long as the associated costs did not exceed this amount.

Obviously, the assumptions made and the procedure used to arrive at the value estimates should be reviewed critically. Nevertheless, the approach has intuitive appeal and utility for decision making. We offer this for consideration primarily to raise awareness of a broad concept of costs and benefits associated with herd management in the Islip situation.

Logistic Regression Models - What Might Effective Programming Accomplish?

To help managers gain a better understanding of the relative importance of various factors to people's (1) opinions of deer and (2) preferences for deer population trends, logistic regression was used to analyze the influence of key variables on those two dependent variables. This procedure is useful in providing an estimate of the relative potential effects of changes in factors influencing the opinions. Of greatest interest are those that can be manipulated by management or educational communications programming.

The best logistic regression model of the probability of having an unconditionally positive attitude about the presence of deer (i.e., "Deer have an aesthetic value; I enjoy having them around.") included 4 independent variables, all significant ($P \leq 0.02$). This model (A) was:

$$\log \frac{(P1)}{(1-P1)} = -2.16 + 1.84\ PROB - 2.38\ COLL + 0.86\ FDAM + 1.01\ LYME + u$$

where:

P1 = probability that a resident will not unconditionally value deer or want them in their neighborhood,

PROB = residents' problem tolerance scale score from WAVS,

COLL = variable indicating whether respondent has deer-car collisions as a primary deer-related concern,

FDAM = variable indicating how respondents felt about deer damage,

LYME = variable indicating whether respondent had Lyme disease as a primary concern.

u = an error term.

The $\underline{R}$ statistic for the model, which is similar in interpretation to the multiple correlation coefficient in linear regression after being corrected for the number of parameters estimated, was 0.615. The model correctly predicted 84.7% of all cases -- 87.8% of those with the positive opinion, and 78.9% of those not of this opinion. The best predictive statistic, the fraction of concordant pairs of observations, was 0.892. This means that in 89% of all possible pairs of respondents, one with a positive attitude about deer and one with a negative attitude, the model correctly indicated the respondent with the positive attitude.

The best logistic regression model of the probability of preferring the deer population to decrease included 2 independent variables, both significant ($P \leq 0.02$). This model (B) was:

$$\log \frac{(PI)}{(1-PI)} = -5.26 + 2.59\ OPIN + 0.92\ PRO + u$$

where:

PI = probability that a resident will prefer the deer population to decrease,

OPIN = residents' opinions of the aesthetic value of the presence of deer,

PROB = residents' problem tolerance scale score from WAVS,

u = an error term.

The R statistic for the model was 0.649. The model correctly predicted 84.8% of all cases -- 69.5% of those preferring a decrease in the deer population, and 90.8% of those not preferring a decrease. The fraction of concordant pairs of predicted probabilities and responses was 0.869.

The unexpected result illustrated by model A was the negative coefficient associated with deer-car collisions as a primary concern. Superficially this indicates that as worries about deer-car collisions become more widespread, more people will want deer in their neighborhood. This seems illogical, and we believe that the relationship reflects an incongruity imposed by our methodology. The question that elicited responses about most important concerns did not have a "no concerns" option. Thus, those who liked deer and had no substantive concerns chose deer-car collisions rather than damage, personal injury, or disease as a concern. This may indicate that deer-car collisions was the only potential problem that those who liked deer felt might affect them; thus it was chosen rather than what they perceived to be a less likely problem. Alternative explanations may exist, but they are not apparent. Consequently, in the following scenarios where model A was used to approximate two program outcomes, no manipulation of the deer-car collision variable was attempted. Only concern about Lyme disease and feelings about damage are addressed.

If an education program to alleviate concerns about Lyme disease was implemented, and was successful to the point where only 10% (rather than 37%) of Islip residents had Lyme disease as their most important concern,

the probability of residents not wanting deer in the area would drop to 20% (rather than the 36% we found). If a deer damage control or mitigation program could be moderately effective such that 65% were unaware of damage (as now), 10% felt damage was negligible (as now), but 25% felt damage was tolerable (about twice that now), and no one felt damage was totally unreasonable, then we could expect the probability of residents not wanting deer to drop to 24%. For comparison, if a deer damage control or mitigation program could be very effective such that 65% were unaware of damage (as now), 25% felt damage was negligible (twice current rate), 10% felt damage was tolerable (similar to current rate), and no one felt damage was totally unreasonable, then we could expect the probability of residents not wanting deer to drop to 8%.

Assume that one or both of the education programs referred to above could be implemented and achieved moderate success, such that the proportion of Islip residents who did not unconditionally enjoy deer dropped to 20% (with those who could enjoy a few deer but worried about damage and disease comprising 15%, and those who considered deer a nuisance 5%). From model B, we could expect this change in opinions about the presence of deer to result in a drop in the proportion of people who wanted a decrease in the deer herd from 28% to 12%.

As with models of this sort, they should be viewed with appropriate caution in light of their many limitations. Nevertheless, the scenarios described above help the program planner put realistic expectations on the extent of change that might be expected from an information program about Lyme disease and a deer damage control/mitigation program.

CONCLUSIONS

The human dimensions of managing the deer herd associated with Seatuck NWR are both interesting and challenging. This situation analysis provides decision makers with insight into the impact of these deer on the community, and on the experiences, perceptions, concerns, and preferences of Islip residents relative to deer management. Furthermore, identification of residents' beliefs and attitudes about wildlife generally provides managers and educators with valuable information for communication planning.

It is apparent that deer cause Islip residents real problems (damage to landscape plantings), and anxiety over potential problems (concerns about disease). At the same time, deer are a valued part of the Islip environment. Most people enjoy having deer around, and few want deer extirpated. Thus, managers are left with the dilemma of reconciling the problems/concerns with the positive values that are held widely. Serving this public satisfactorily will require ingenuity and resourcefulness, especially in light of the attitudinal data indicating the generally negative view of recreational hunting. This nontraditional situation may require unconventional approaches. The greatest challenge may lie here. Can traditional approaches that have served deer managers fairly well in rural and wilderness environments be set aside to tackle this nontraditional situation effectively? Results from this study indicate that an unbiased perspective is needed, if public interest is to be served and manager-public conflicts are to be avoided.

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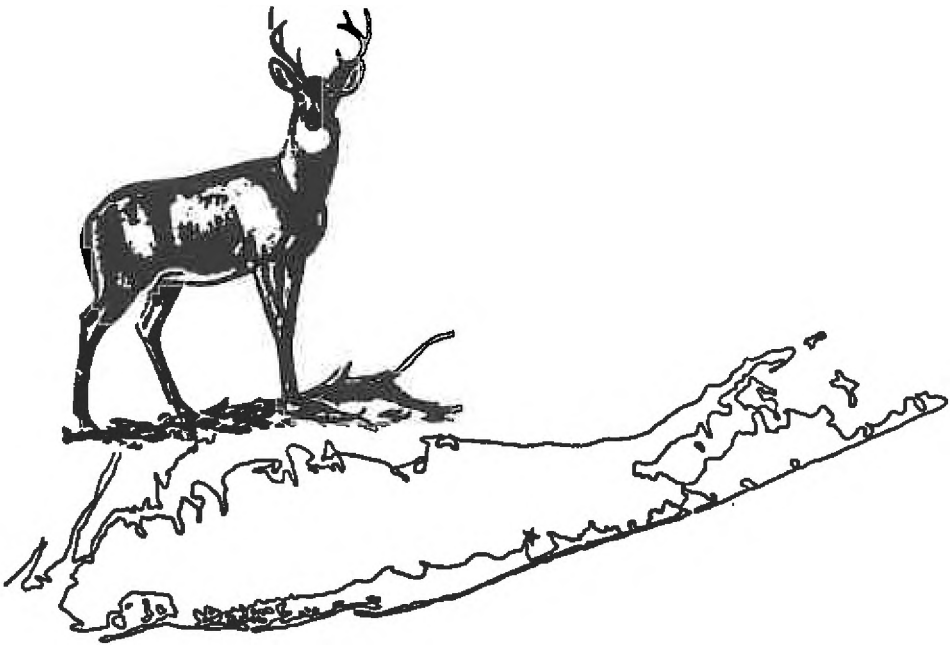
APPENDIX A:

MAIL QUESTIONNAIRE

DEER AND YOUR COMMUNITY

A Survey of Residents of Islip, New York



DEER AND YOUR COMMUNITY: A SURVEY OF RESIDENTS OF ISLIP, NEW YORK

conducted by the

Department of Natural Resources

New York State College of Agriculture and Life Sciences

Cornell University

and

Seatuck Research Program

Laboratory of Ornithology

Cornell University

This survey has been developed to help biologists studying the white-tailed deer herd of the Seatuck Refuge and nearby environs. We are interested in learning more about local residents' interests in, contact with, and concerns about the deer herd. Information supplied by you will help broaden our perspectives about the deer resource and how it might be managed. Understanding the interaction of deer and people is an important aspect of the overall deer research effort.

Your opinions about deer are of interest to us even if you have not seen a deer, so please fill out this questionnaire and return it to us as soon as possible. Return postage has been provided.

Your cooperation in this study will be greatly appreciated.

THANK YOU FOR YOUR ASSISTANCE.

1. How long have you resided at your current address? (If it has been less than one year, please give fraction of year.)

   _____years

2. Please describe your property by indicating on the following checklist those items you have on your property: (Check all that apply.)

   _____vegetable garden

   _____flower garden

   _____fruit tree(s) (please indicate how many:_____fruit trees)

   _____shrubs and other woody ornamentals (how many?:_____shrubs/ ornamentals)

3. Have you heard or read about the white-tailed deer research being conducted by Cornell University/Seatuck Research Program in your area?

   _____No

   _____Yes

4. Have you ever seen a deer in the vicinity of your residence in Islip?

   _____No (Skip to Question 7)

   _____Yes

   If "yes", when did you first see a deer in the vicinity of your residence? 19_____.

5. Over the past 3 years, what trend have you seen in deer numbers in the vicinity of your residence? (Check one.)

   _____more deer now than 3 years ago

   _____fewer deer now than 3 years ago

   _____about the same number of deer now as 3 years ago

   _____don't know

6. Have any of the deer you've seen in the vicinity of your residence been wearing numbered collars?

   _____No

   _____Yes

   _____Don't Know

7. Have you *seen deer* or *evidence of deer on your property* in the *past 12 months*? (Check all that apply.)

_____saw a deer on my property

_____saw a deer feeding on my property

_____saw evidence of where deer had been feeding on my property

If you have never seen deer feeding or evidence of deer feeding on your property, skip to question 15.

8. Please indicate below the types of plants deer appeared to be feeding on by checking (✔) the box to the left of the item. Then indicate the extent of damage. This is for the past *12 months* only.

(✔) Types of Plants	Extent of Damage
_____garden vegetables	% damaged=_____%
_____flowers	% damaged=_____%
_____fruit trees	% damaged=_____%, number of shrubs damaged=____
_____shrubs or other woody ornamental plantings	% damaged=_____%, number of shrubs damaged=____

9. In the past 12 months, about what percent of each type of plant was in your estimation damaged slightly, moderately, or severely? Please assign the proportion of damage in each severity category for each type of plant so that the percentages total 100%.

	Type of Plant			
Severity of Damage	Garden Vegetables	Flowers	Fruit Trees	Shrubs or Ornamental Plantings
no damage	____	____	____	____
slight	____	____	____	____
moderate	____	____	____	____
severe	____	____	____	____
TOTAL	100%	100%	100%	100%

10. If any plantings had to be replaced or currently need to be replaced because of deer damage to them in the past 12 months, please give your estimate of the total cost for replacement.

(✓) Types of Plants	Estimated Cost of Replacement (whether or not you have actually incurred the cost)
_____garden vegetables	$_____
_____flowers	$_____
_____fruit trees (how many? _____)	$_____
_____shrubs or other ornamental plants (how many? _____)	$_____

11. Have you reported deer damage of plantings on your property to any officials?

_____No

_____Yes

If "yes", to whom have you reported deer damage?

_____municipal authorities

_____New York State Department of Environmental Conservation

_____Cooperative Extension

_____Seatuck Research Program

_____U.S. Fish and Wildlife Service

12. Have you taken any steps to protect your plantings?

_____No

_____Yes

If "yes", what measures have you taken?

_____repellents

_____scare devices

_____fencing

_____other (specify _____)

In the past 12 months, how much have you spent on deer damage *control* (not replacement of damaged plants)? $_____in past 12 months.

13. From whom have you sought damage control information? (Check all that apply.)

_____No one

_____New York State Department of Environmental Conservation

_____Cooperative Extension

_____Seatuck Research Program

_____U.S. Fish and Wildlife Service

_____commercial pest control operators

_____retailers of materials and supplies for control

_____Other (please specify: _____)

14. Overall, how would you describe the amount of deer damage to your property within the past 12 months? (Check one.)

_____none

_____light damage

_____moderate damage

_____substantial damage

_____severe damage

15. How do you feel about the amount of damage your property received from deer in the past 12 months? (Check one.)

_____not aware of any damage

_____negligible damage

_____the amount of damage was tolerable in exchange for having deer around

_____the amount of damage was unreasonable

16. Which of the items below are a concern you or your family have about deer in your neighborhood? (Check all that apply.)

_____deer/car collision

_____Lyme disease transmission

_____damage to vegetable garden

_____damage to yard plantings

_____personal injury from deer

Please *circle* the *one most important* item above.

17. Generally, how do you feel about having deer in your neighborhood? (Check one.)

_____Deer have an esthetic value; I enjoy having them around.

_____I could enjoy a few deer, but I worry about disease and/or damage.

_____I generally regard deer as a nuisance; I could get along without any deer.

_____No particular feelings about deer.

18. Please indicate below whether you would like deer populations in your neighborhood to increase, decrease, or remain at their current level. (Check one.)

_____moderately increase deer populations

_____slightly increase deer populations

_____maintain deer populations similar to present levels

_____slightly decrease deer populations

_____moderately decrease deer populations

19. People differ in the ways they interact with wildlife. Some of these ways are listed below. Please indicate how you feel about the following by your agreement or disagreement with each statement. (Indicate your responses for each statement by checking (✓) the appropriate category.)

IT IS IMPORTANT FOR ME PERSONALLY:	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
That I talk about wildlife with family and friends	( )	( )	( )	( )	( )
That I observe or photograph wildlife	( )	( )	( )	( )	( )
That I tolerate most wildlife nuisance problems	( )	( )	( )	( )	( )

That I trap furbearing animals for the sale of furs or pelts	( )	( )	( )	( )	( )
That I consider the presence of wildlife as a sign of the quality of the natural environment	( )	( )	( )	( )	( )
That I hunt game animals for recreation	( )	( )	( )	( )	( )
That I see wildlife in books, movies, paintings, or photographs	( )	( )	( )	( )	( )
That I tolerate most levels of property damage by wildlife	( )	( )	( )	( )	( )
That I express opinions about wildlife and their management to public officials or to officers of private conservation organizations	( )	( )	( )	( )	( )
That I know that wildlife exist in nature	( )	( )	( )	( )	( )
That I tolerate the ordinary risk of wildlife transmitting disease to humans or domestic animals	( )	( )	( )	( )	( )
That I hunt game animals for food	( )	( )	( )	( )	( )
That local economies benefit from the sale of equipment, supplies, or services related to wildlife recreation	( )	( )	( )	( )	( )
That I appreciate the role that wildlife play in the natural environment	( )	( )	( )	( )	( )
That wildlife are included in educational materials as the subject for learning more about nature	( )	( )	( )	( )	( )
That game animals are managed for an annual harvest for human use without harming the future of the wildlife population	( )	( )	( )	( )	( )
That I tolerate the ordinary personal safety hazards associated with some wildlife	( )	( )	( )	( )	( )
That I understand more about the behavior of wildlife	( )	( )	( )	( )	( )

The following personal information will be kept strictly confidential and is never associated with your name.

20. What is your age?

_____Years

21. What is your sex?

_____Male

_____Female

22. Please circle the highest grade or year of schooling you have completed:

Elementary School:	1	2	3	4	5	6	7	8
High School:	9	10	11	12				
College:	1	2	3	4	5	6	7	8 years or more

23. Which of the following wildlife-related activities have you or members of your household participated in during the past 12 months? (Check all that apply.)

_____wildlife observation

_____hunting

_____bird feeding

_____deer feeding

_____trapping

_____wildlife photography

_____wildlife painting/drawing

As part of the deer research being conducted in your area, wildlife biologists are studying the movements of deer. This is being done directly by visual sightings and indirectly by radio-tracking techniques. Another indirect technique is being considered—establishment of ornamental shrubs known to be attractive as food to deer. Browsing on these plants by deer would serve as indicators of deer's presence. Would you consider being a cooperator in this effort by permitting a biologist to plant one of these indicator shrubs on your property?

_____No

_____Yes

We are interested in determining if there are any patterns to the location and extent of damage and if there are any obvious feeding preferences for particular species and varieties of plants. If you identified damage to shrubs or fruit trees due to deer, would you be willing to cooperate with this study by allowing a project biologist to inspect the damage?

_____No

_____Yes

If you indicated willingness to cooperate in either item above by answering "Yes", please fill in your name and telephone number where you can be reached during weekdays.

Name: _____

Telephone: _____ - _____

Please use the space below for any other comments or observations you may have about deer.

THANK YOU FOR YOUR TIME AND EFFORT.

TO RETURN THIS QUESTIONNAIRE, simply seal it and deposit it in any mailbox. The postage has been provided.

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APPENDIX B:

MAIL SURVEY COVER LETTERS

AND FOLLOW-UP LETTERS

New York State College of Agriculture and Life Sciences
a Statutory College of the State University
Cornell University

Department of Natural Resources
Fernow Hall, Ithaca, N. Y. 14853-0188

Fishery Science
Forest Science
Wildlife Science
Natural Resources
Resource Policy
and Planning
Aquatic Science

March 14, 1985

Dear Islip Resident:

Cornell University and the Seatuck Research Program are conducting a study of the white-tailed deer herd associated with the Seatuck Refuge and nearby environs. We are interested in learning more about local residents' interests in, contact with, and concerns about the local deer herd. Information supplied by you will help broaden our perspectives about these deer and how they might best be managed.

Your opinions about deer are of interest to us even if you have not seen a deer in your neighborhood. Your response is important to the success of this study. Please fill out the enclosed questionnaire and return it to us as soon as possible. Return postage has been provided.

Your cooperation in this study is greatly appreciated.

Sincerely,

Daniel J. Decker

Daniel J. Decker
Research Associate
and
Wildlife Extension Specialist
Natural Resources

DJD:k
enclosure

New York State College of Agriculture and Life Sciences
a Statutory College of the State University
Cornell University

Department of Natural Resources
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March 21, 1985

Dear Islip Resident:

Last week we mailed you a survey asking for your opinion of and interest in the white-tailed deer herd in your community.

If you have already completed and returned the survey, please accept our sincere thanks for your help. If you have not yet completed it, please do so today. The survey was sent to a randomly selected but representative group of Islip residents. We need your response for the survey to accurately represent all Islip residents.

Thanks again for your cooperation.

Sincerely,

Daniel J. Decker

Daniel J. Decker
Research Associate
and
Wildlife Extension Specialist

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April 2, 1985

Dear Islip Resident:

About 3 weeks ago we sent you a questionnaire that sought your opinions about and interest in the deer herd associated with the Seatuck Refuge and nearby environs. If you have already completed and returned it to us please accept our sincere thanks. If you have not yet done so, please take the time to complete it today.

We are interested in learning more about local residents' interests in, contact with, and concerns about the deer herd. Information supplied by you will help broaden our perspectives about the deer resource and how it might be managed. Understanding the interaction of deer and people is an important aspect of the overall deer research effort.

Your cooperation in completing the questionnaire will be appreciated. Your response is necessary to improve the usefulness of the study. In the event your questionnaire has been misplaced, a replacement is enclosed. Postage has been provided. Simply seal it and drop it into any mailbox.

Sincerely,

Daniel J. Decker

Daniel J. Decker
Research Associate
and
Wildlife Extension Specialist
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April 11, 1985

Dear Islip Resident:

I am writing to you about our study of Islip residents' interests in, contact with, and concerns about your local deer herd. We have not yet received your completed survey.

The large number of questionnaires returned to date is very encouraging. But, whether we will be able to describe accurately how Islip residents feel about the local deer herd depends on you and others who have not yet responded. This is because our past experiences suggest that those of you who have not yet sent in your questionnaires may hold quite different views than those who returned their questionnaires early.

I am writing to you again because of the significance each and every questionnaire has to the usefulness of this study. To ensure that the results of this study faithfully represent public opinion, it is important for us to know how you feel about deer and their management in Islip. Your response is important no matter what your feelings or experiences are.

Your contribution to the success of this study will be greatly appreciated.

Sincerely,

Daniel J. Decker

Daniel J. Decker
Research Associate
and
Wildlife Extension Specialist
Natural Resources

DJD:k

APPENDIX C:

WILDLIFE PROBLEM TOLERANCE RESPONSE DISTRIBUTION CURVES

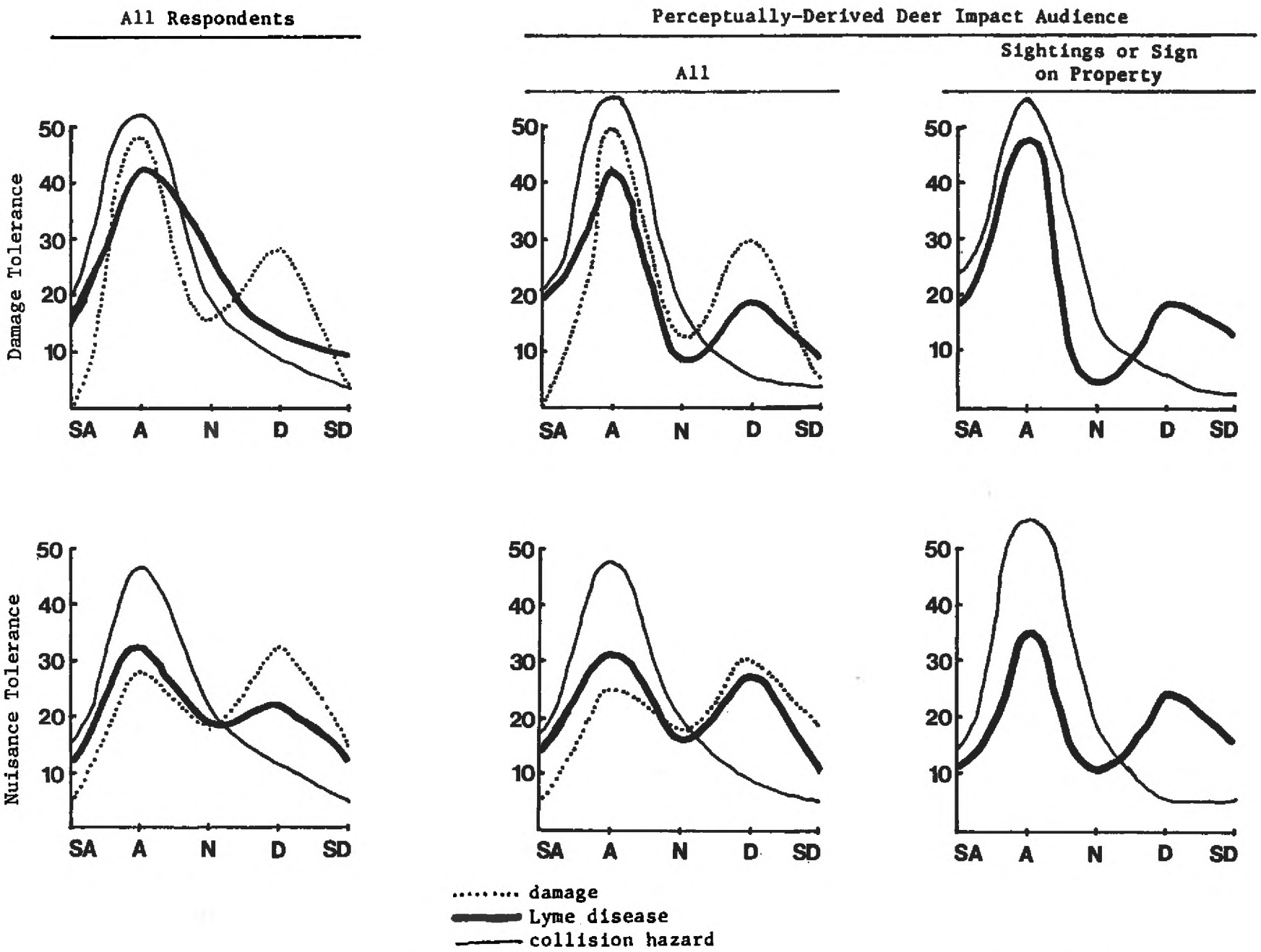

Figure C-1. Wildlife Problem Tolerance Beliefs, by Primary Concern for Various Segments (SA=Strongly Agree, A=Agree, N=Neither Agree nor Disagree, D=Disagree, SD=Strongly Disagree).

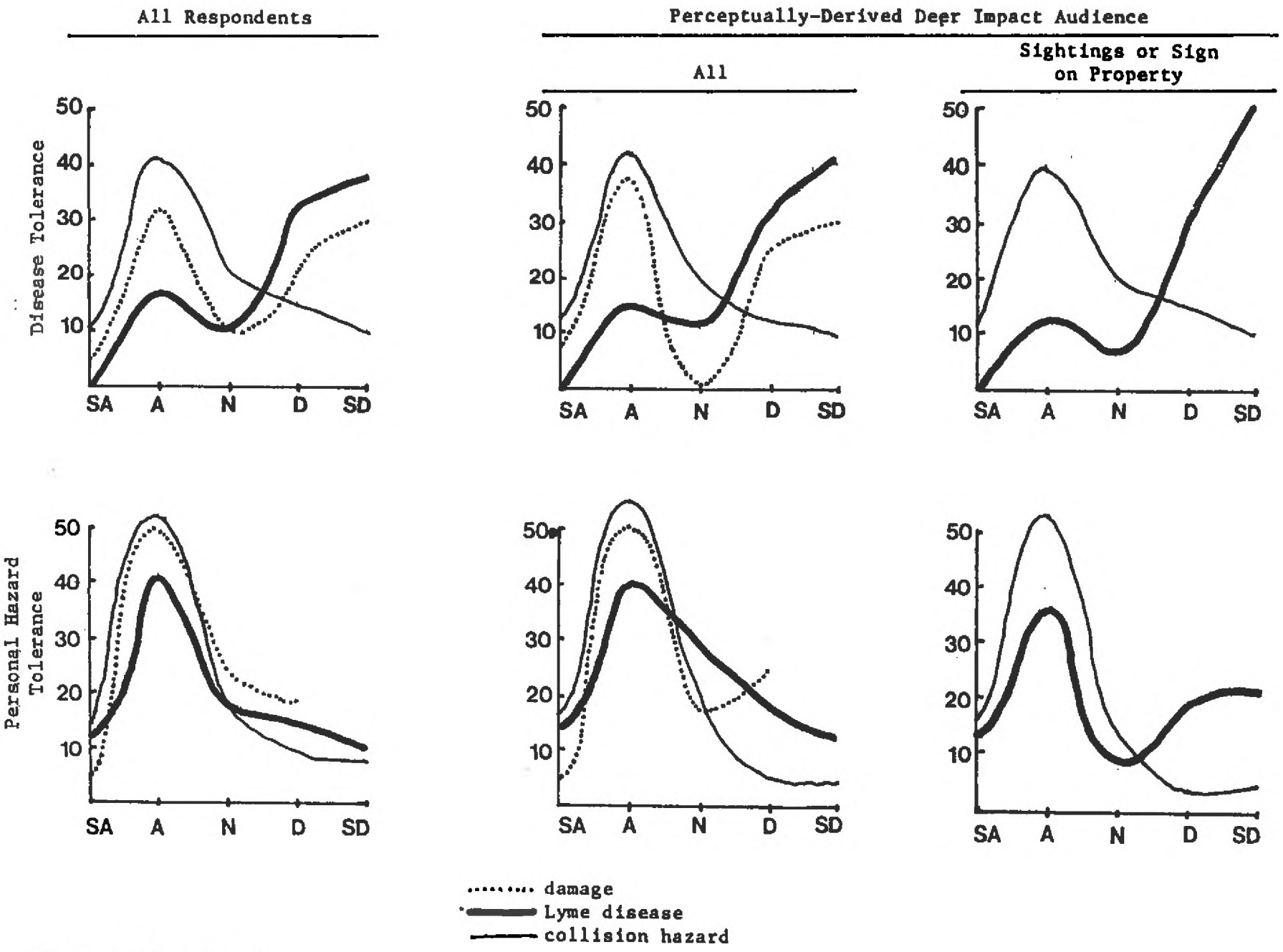

Figure C-1(continued).

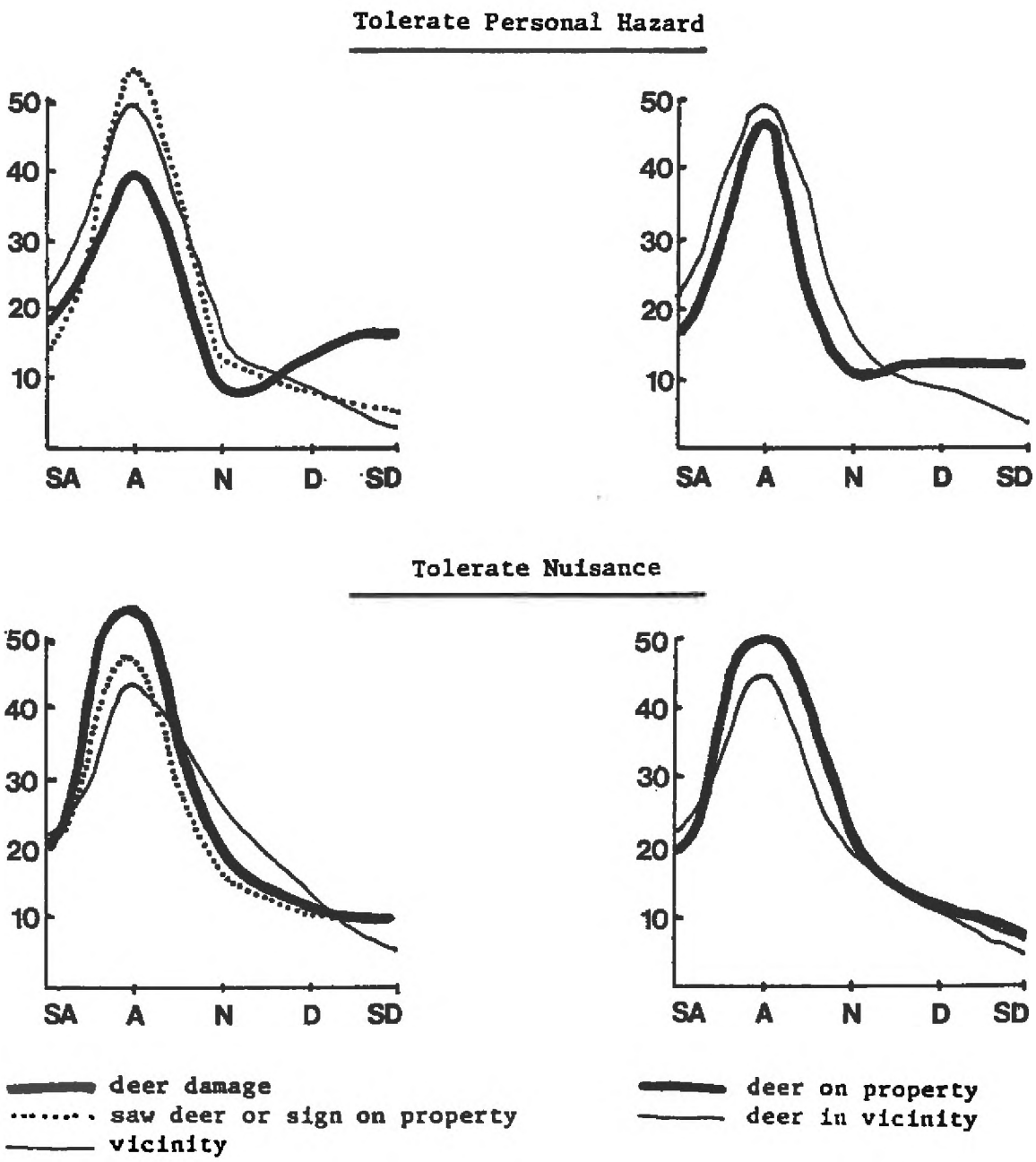

Figure C-2(continued).

Addendum

In the copying process, these pages were misplaced.

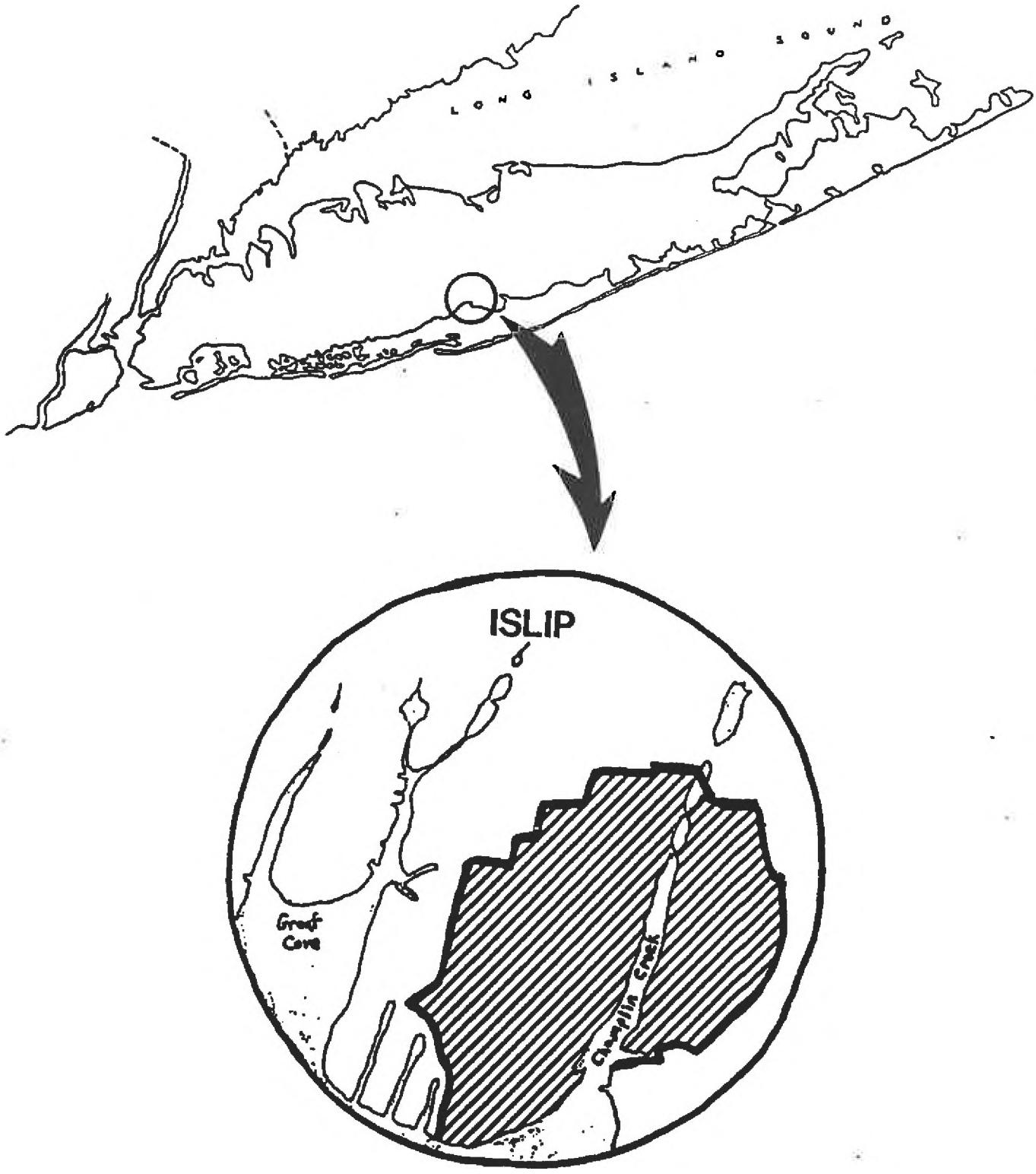

Figure 1. Study Area (shaded)--Seatuck National Wildlife Refuge and Adjacent Residental Area, Islip (Long Island), New York.

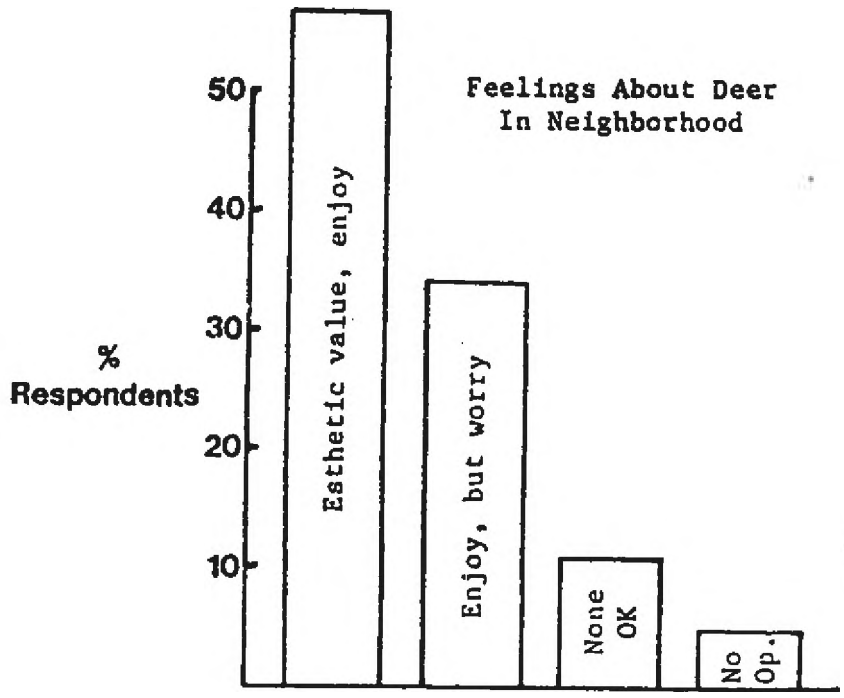

Figure 2. Attitudes of Islip Residents Toward the Presence of Deer in Their Community.

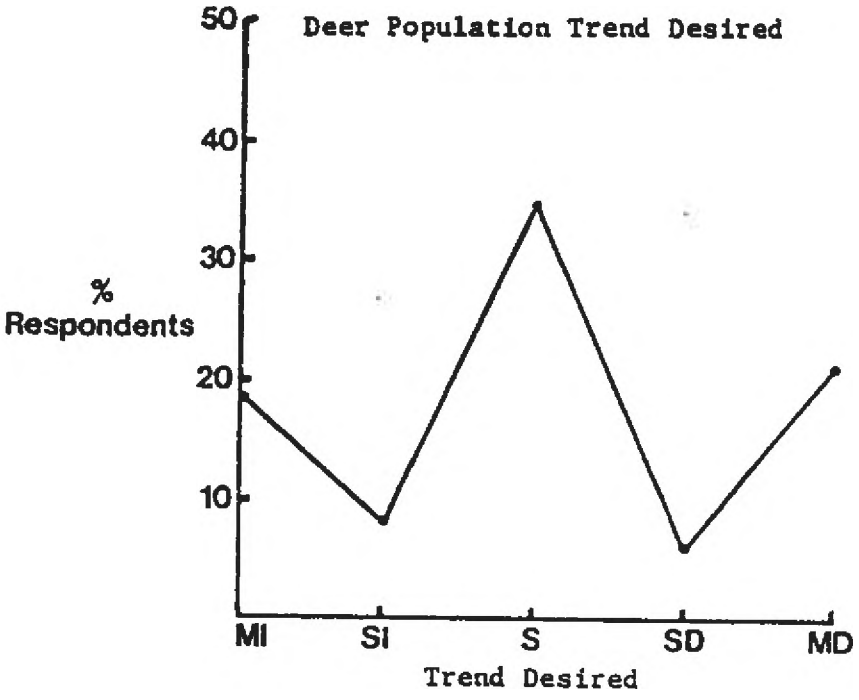

Figure 3. Preferences of Islip Residents for Future Deer Population Trends in Their Community (MI=Moderately Increase, SI=Slightly Increase, S=Remain the Same, SD=Slightly Decrease, MD=Moderately Decrease).

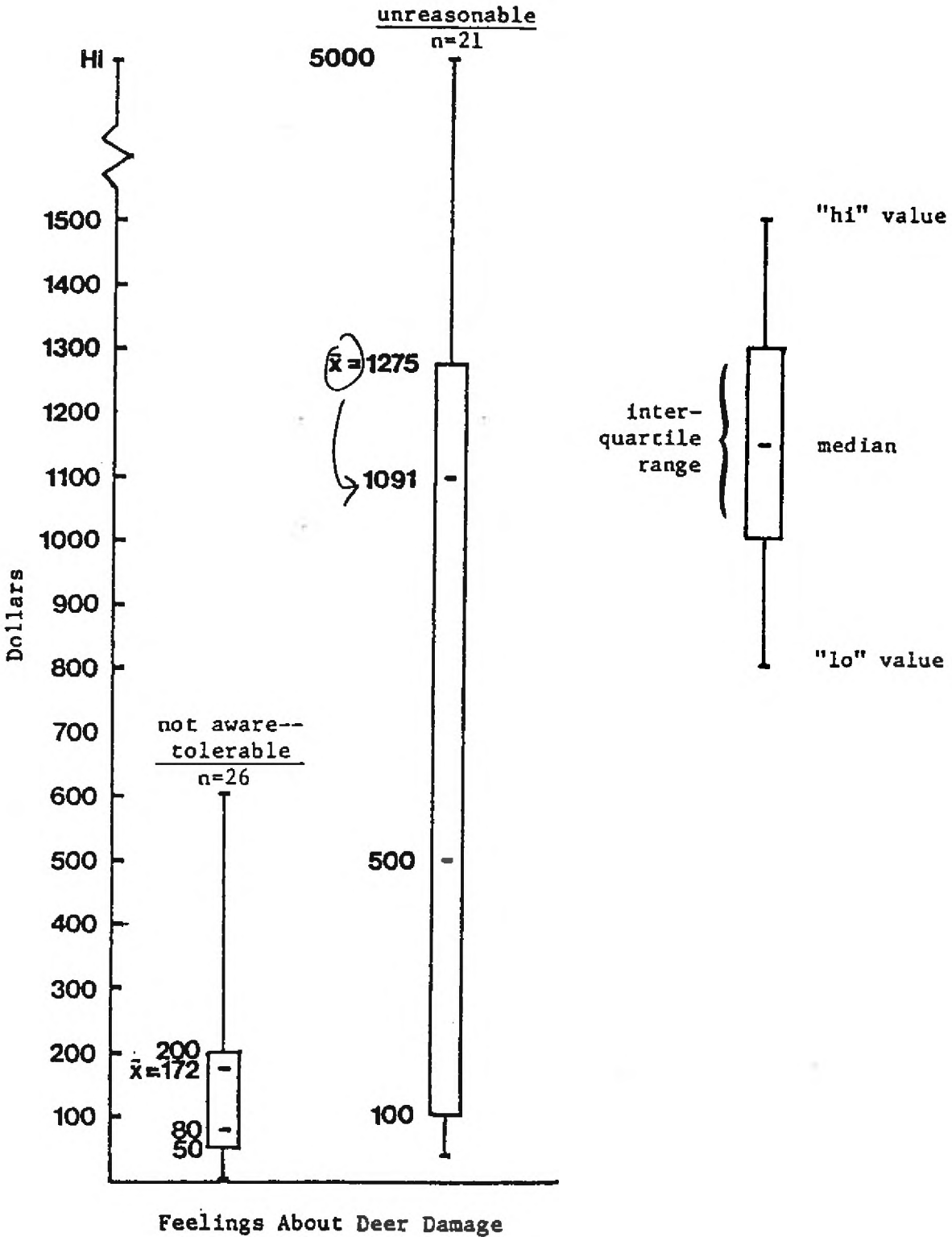

Figure 5. Damage Estimates, by Tolerance (PDDI Audience).